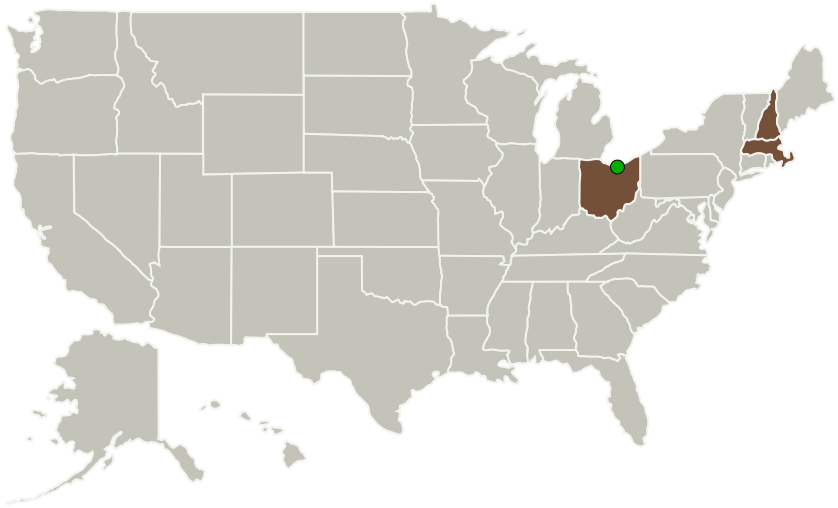
A Maximum Power Tracker for Improved Thermophotovoltaic Power Generation, Phase I

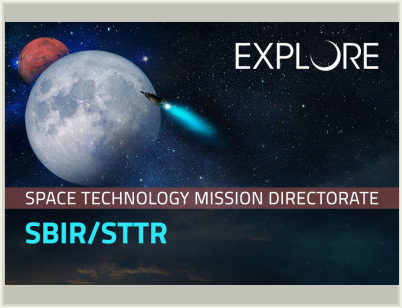
Completed Technology Project (2010 - 2011)

Project Introduction

Radioisotope Power Systems (RPS) are critical for future flagship exploration missions in space and on planetary surfaces. Small improvements in the RPS performance, weight, size, and/or reliability can have a dramatic effect on the scientific capability of the vehicle and the overall mission costs. Radioisotope Thermophotovoltaic (RTPV) energy converters are a particular type of RPS that directly converts the heat produced by a General Purpose Heat Source (GPHS) to electrical power using a specialized Photovoltaic (PV) cell. A key element in an RTPV system is the power conversion electronics system that efficiently converts the low-voltage current from each PV cell into useable, stable bus voltage for powering spacecraft systems despite issues such as non-uniform illumination, PV cell degradation, and decay of the GPHS source. In this project, Creare and the Massachusetts Institute of Technology (MIT) propose to develop an advanced, multi-channel maximum power point tracking module (MPPT) that is optimized for RTPV systems. The converter will provide stable output voltage from a 16-cell PV array that, when coupled with advanced PV technology of the RTPV system, will provide high system efficiency. In Phase I, we will design a prototype power tracking module, which will be fully characterized for conversion efficiency. We will also assess the impact of this new MPPT on the overall RTPV system design and performance.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Creare LLC	Lead Organization	Industry	Hanover, New Hampshire
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio
Massachusetts Institute of Technology(MIT)	Supporting Organization	Academia	Cambridge, Massachusetts

Primary U.S. Work Locations	
Massachusetts	New Hampshire
Ohio	

Project Transitions

January 2010: Project Start

January 2011: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138735)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Creare LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

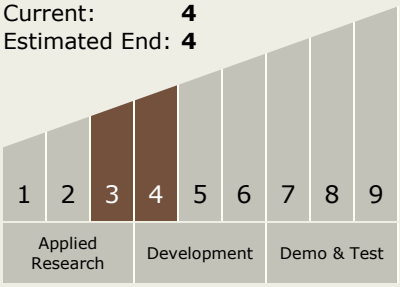
Carlos Torrez

Principal Investigator:

Richard W Kaszeta

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.3 Power Management and Distribution
    - TX03.3.3 Electrical Power Conversion and Regulation

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System